In the Matter of   )
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Office of Engineering and Technology   )   ET Docket No. 13-26
Releases and Seeks Comment on Updated   )
OET-69 Software   )

Reply Comments of RadioSoft

RadioSoft, pursuant to §1.415 of the Commission's Rules hereby respectfully submits its Reply Comments in this proceeding.

RadioSoft, with its associated companies including Frequency Finder, Inc., is a frequency coordination contractor for AASHTO (Public Safety under §90.20, as well as AAA, MRFAC, FIT and AAR (Industrial/Business under §90.35). It is the principal software supplier to the coordination community generally, as well as to the Commission and many other agencies of the Federal government. It has been active in spectrum allocation policy for decades, and is currently a member of the Land Mobile Communications Council's Spectrum Committee, which has often asked its advice on engineering matters. It has provided OET-69 services since that process was first defined, in both stand-alone and dedicated server versions.

These Reply Comments address solely Comments concerning the *TVStudy* software described in Docket 13-26, as we are unconcerned with the forthcoming spectrum auctions, or any short-term impact generally.

In reviewing the Comments, we find need for two arguments in Reply: the benefits of standardization, and the degree to which the old three arc-second terrain database compromises accuracy due to the methods with which it was prepared. Lastly, we argue that should *TVStudy* be adopted, a process for its subsequent improvement should be put in place.

Standardization

1: Hardware and source code
The Commission published its code for the original OET-69 software (in Fortran), but due to the high sensitivity to terrain effects (indeed, a single populated cell changing from served to unserved could scuttle or permit an entire allocation) and to calculation methods specific to the original code, results matching the FCC's analysis could be obtained only on a specific brand of computer, with a *specific processor* installed. Thus the general benefit of a published standard, which allows any reasonably competent

developer to obtain like results, was frustrated. RadioSoft has such hardware running in its server facility; it markets conforming OET-69 studies at retail. Nevertheless, we believe that making the allocation, service determination and interference calculation processes transparent and readily available to interested parties with no special hardware is a benefit to all which far outweighs all of the short term concerns articulated generally by TV licensees and their representatives. The question of when to deploy such standardized software is also easy to resolve, as the long-term benefit of standardized processes is directly proportional to the amount of work based on those standards. This refutes the argument that one should delay implementation subsequent to the Incentive Auction, for example, or for any other short-term reason-- were one to do so, all analysis of the most demanding spectrum packing ever undertaken would be practically impenetrable to later scrutiny.

2: Contour standardization

As one of the ten designated White Space Database Administrators, we are participating in an effort to standardize TV service contours, which was made necessary by an unprecedented requirement that service contours among the database providers would match within ten meters of contour distance at any azimuth. In order to accomplish that goal, it was found that not only standardizing the terrain databases, but that the methods of point extraction, determination of the number of points for each radial's Height Above Average Terrain (HAAT) calculation, and even methods for resolving differences between overlapping terrain data files had to be carefully described[1]. As a great deal of effort went into this description (the current document is publicly available in the White Space Docket[2]) it is desirable to merge standards for the White Space implementation of TV contours with *TVStudy*, and for contour calculation generally across all FCC branches. HAAT and contours are bureaucratically derived, and much time, effort and understanding would be saved by a standard method[3]. As frequency coordinators for Part 90 services responsible for generating hundreds of contours daily, we can safely assert that resolving minor differences in contour calculation software would be of great benefit to both the Public Safety and Industrial/Business radio user community, as well as the parties to these Comments.

Derivation of the "old" three arc-second database

These data were derived from the 1:250,000 scale 1° x 2° topographical maps published by the United States Geological Survey, and digitized by Honeywell under an Army Ordnance Survey contract in the late 1960's. I well recall my reaction when in 1988 I first was able to see and manipulate them in 3D on my PC--it was as if the Divinity had employed a massive sanding block to all features great and small. The

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[1] We found discrepancies in both US and Canadian tile overlaps.

[2] This Document, titled "Channel Calculations for White-Spaces", is currently in revision 1.29, and is essentially complete with respect to all contours based on transmit locations in the USA (more than 16 kilometers from the Canadian border) and Mexico. Work on Canadian cross-border analysis remains in active development.

[3] The "White Space" method also uses the USGS National Elevation Database, which has one arc-second tiles.

reasons for this are various, among them the 100 foot contour interval of most base maps, and a poor choice of interpolation algorithm, but the effect on terrain-sensitive computations is evident in the examples filed by CTIA[4] and the National Association of Broadcasters (NAB)[5], where all three CTIA examples and the vast majority of NAB analysis show reductions in service and consequent population--this is not coincidental. Since "price-per-pop" is fluent in spectrum and advertising transactions, it is no wonder that the NAB and others oppose the use of more accurate terrain data with its tiny increases of shadow. Given a longer term outlook, however, those prices will reflect actual uses more accurately, so that too is a passing issue.

NAB in its comments may in certain places attempt to conflate the Congressional mandate to preserve actual service with the calculation of that service. However, referring to the "predicted losses in population served for 1,896 of 2,228 stations"[6] or that the "proposed changes to 'Error Code 3' ... indicates that they will adversely affect 87% to 97.3% of stations" constitutes no real adverse effect nor real loss in population, and it is presumably the true service loss rather than the predicted loss which Congress wished to avoid. Anita Longley's famous "Error code three" is applied when she determined that the result might be subject at that point to an unacceptable statistical deviation. Most of the larger "losses" cited by the NAB occur over doubly diffracted paths, where Longley-Rice is well-known to be less accurate, and where service is very unlikely, especially at UHF. Asking to preserve the erroneous policy of assuming service to be present in all those cases typically inflates the power densities there by multiples of hundreds or thousands. All of the subsequent arguments[7] follow: so long as the improvement in accuracy is made *with sufficient foreknowledge*, and is reasonably available, the playing field is shifted for all to no one's detriment. We agree with the NAB that substituting *TVStudy* for current OET-69 software is a major change, and that sufficient time for deliberation is necessary. Unlike the NAB however, which sees "no countervailing benefit"[8] to the new *TVStudy* procedures, we find that the benefit here extends far beyond predicting TV service and interference.

Other issues

In its Comments, the NAB opposes the use of beam tilt values. Here is a typical case where swiftly increasing demand on spectrum resources causes those in the allocation industry to come ever closer to engineering, with its consequent reliance on good data for "real world" modeling. We cautiously support the drift toward engineered spectrum policy, but we point out that it is only a partial solution to use the beam tilt value in

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[4] http://apps.fcc.gov/ecfs/document/view?id=7022133733, pp. 9 - 16
[5] NAB comments throughout, available at http://apps.fcc.gov/ecfs/document/view?id=7022133272
[6] NAB comments at p. 9
[7] population database, terrain database cell size, inaccurate CDBS data, antenna beam tilt and depression angles, coordinate precision, analysis cell grid size and Longley-Rice error codes
[8] NAB comments at p. 22

CDBS, since that describes only the elevation of the main lobe (and only for more typical cases), and not its shape. So while it is an improvement to at least point the lobe at the right angle, there needs to be an eventual improvement in CDBS data, and in *TVStudy*, to enable a better antenna pattern model[9]. This raises questions about technological improvements in modeling generally, and it is thus our opinion that not only should *TVStudy* be adopted as the new OET-69 method, but that a process be defined, with sufficient notice and transparency, to improve it as the market and available data allow.

In conclusion, while we understand that standardization inevitably involves a degree of painful change, we support the initiative of the Office of Engineering and Technology's public submission of improved modeling software, and urge that a way be found to once-for-all define contour methodology--the current Rule[10], which provides for "at least 50 equally spaced points" in determination of HAAT is, like three arc-second terrain data, an indefensible antique and a burden to the public service.

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[9] This point is echoed by NAB, at p. 22

[10] §73.313(d)(3), which was unfortunately defended by the Commission in the 90's by reference to the paper topographical maps we all used before computers. This Rule has several other important mathematical divergences from the TVFMFS() routine in the current OET-69 software as well as *TVStudy*, and needs to be conformed to whatever practice is decided.